flare at two different angles, the ground plan being a right angle. To describe proceed as follows: On any piece of board draw two parallel lines any distance apart, as A B C D. Construct the angles the sides are to make, as A N and B N. From N square down a line, making N R equal N A, and K N equal N B. From A and B square down the lines, cutting at D and C. Join K D; this gives bevel 2 as the cut on face of narrow side. Now from R draw through C, and we have bevel 3 for cut on the wide side.

To find the form of a corner post to fit the angle of the flared sides, we proceed as follows: Extend the line A N to cut the line R C at P, from which square up a line cutting at L. From N draw through L, and we have the form of corner post, also bevel 4 for shoulder cuts of cross-rails of framing. If the sides are to make a butt joint instead of a mitred one, then bevel 4 is the direction of cuts on the ends. To understand this matter clearly, the student should practise in cutting cardboard, as the operation will give him more real and practical knowledge than it is possible for him to acquire by any other means.

Nothing can be more simple or more accurate than this method, and, as already mentioned, its correctness may be easily tested by first drawing the "spread-out," as shown on the upper portion of the Plate, on cardboard, and cutting through on the lines marked x x x x; then fold on the lines marked o o o. Bring the points S and S together, and the mode of construction will readily be understood.

The flares may be any angle; the result will always be the same.

Practical Carpentry.

COVERING OF SOLIDS.

To find the covering of a right cylinder:

PLATE 59.—Let A B C D (Fig. 1) be the seat of generating section. On A D describe the semicircle A 5 D, representing the vertical section of half the cylinder, and divide its circumference into any number of equal parts, 1 2 3 4 5, etc., and transfer those divisions to the lines A D and B C produced: then the parallelogram D C, G F will be the covering required.

To find the edge of the covering when it is oblique in regard to the sides of the cylinder:

Let A B C D (Fig. 2) be the seat of the generating section, the edge B C being oblique to the sides A B, D C: draw the semicircle A 5 D, and divide it into any number of parts, as before; and through the divisions draw lines at right angles to A D, producing them to meet B C in *r s t u v*, etc. Produce A D, and transfer to it the divisions of the circumference, 1 2 3 4 5 6, etc.; and through them draw indefinitely the lines 1 *a*, 2 *b*, 3 *c*, perpendicular to D F: to these lines transfer the lengths of the corresponding lines intercepted between A D and B C—that is, to 1 *a* transfer the length *p z*, to 2 *b* transfer *o y*, and so on, by drawing the lines *z a*, *y b*, *x c*, etc., parallel to A F, the intersections; then shall D F C G be the development of the covering of A B C D.

To find the covering of a semi-cylindric surface contained between two parallel planes perpendicular to the generating section:

Let A B C D (Fig. 3) be the seat of the generating section: from A draw A G perpendicular to A B, and produce C D to meet it in E.—on A E describe the semicircle, and transfer its perimeter to E G, by dividing it into equal parts, and setting off corresponding divisions on E G. Through the divisions of the semicircle draw lines at right angles to A E, producing them to meet the lines A D and B C, in *i k l m*, etc. Through the divisions on E G draw lines perpendicular to it; then through the intersections of the ordinates of the semicircle, with the line A D, draw the lines *i a*, *k z*, *l y*, etc., parallel to A G, and where these intersect the perpendiculars from E G, in the points *a*, *z*, *y*, *x*, *w*, *v*, *u*, etc., trace a curved line G D, and draw parallel to it the curved line H C; then will D C, H G, be the development of the covering required.

To find the covering of a semi-cylindric surface bounded by two curved lines:

Figs. 4, 5, 6.—The construction to obtain the developments of these coverings is precisely similar to that described in Fig. 3, as will be evident on inspection.

To form the edge of a cylindric surface terminated by a curved line, so that when the envelope is applied to the surface its edge may coincide with a plane passing through three given points:

Let A E D (Figs. 7 and 8) be the base of the solid. Draw A B and D C perpendicular to A D, and make A B equal to the height of the point whose seat is A, and D C equal to the height of the point whose seat is D. On D C make H equal to the height of the point whose seat is E: join B C. Draw H L (Fig. 7) parallel to A D and H K (Fig. 8), cutting B C in L. Draw L *a* parallel to D C, cutting A D in *a*: number of equal parts in 1, 2, 3, 4, etc., and extend them on A D produced to F. Then join *a* E. Divide the arc of the base into any to find any point in the envelope—suppose that which corresponds to *b* on the seat. Draw *b q* parallel to *a* E, cutting A D at *q*; draw also *q n* parallel to D C, cutting B C in *n*. Make *q o* equal to *q n*, and *o* is a point in the line required. Proceed in the same

manner with other points until the line C *o* G (Fig. 7) and C L *o* G (Fig. 8) is obtained.

To find the covering of the frustum of a cone, the section being made by a plane perpendicular to the axis :

Let A C E F (Fig. 9) be the generating section of the frustum. On A C describe the semicircle A B C, and produce the sides A E and C F to D. From the centre D, with the radius D C, describe the arc C H ; and from the same centre, with the radius D F, describe the arc F G : divide the semicircle into any number of equal parts, and run the same divisions along the arc C H ; draw the ordinates to the semicircle through the points of division, at right angles to, and meeting A C ; and from the points *o n m*, etc., where these ordinates cut the line A B, draw lines to the point D ; and from the last division in the arc C H draw also a line to the point D ; then shall C H G F be half the development of the covering of the frustum A C F E.

To find the covering of the frustum of a cone the section being made by a plane not perpendicular to the axis :

Let A C F E (Fig. 10) be the frustum. Proceed as in the last problem to find the development of the covering of the semicone : then, to determine the edge of the covering on the line E F. From the points *p q r s t*, etc., draw lines perpendicular to E F, cutting A C in *y x w v u ;* and the length *u t* transferred from 1 to *a*, *v s* transferred from 2 to *b*, and so on, will give *a b c d e* G, points in the edge of the covering.

We have now arrived at that stage where we can bring before the student, practical examples of works in carpentry and joinery, and in our next we intend to do so, giving such lines as may be necessary to give a clear idea of how the work should be executed.

If the reader has followed the papers on this subject closely, he will have no difficulty in comprehending what follows.

The Sectorian System of Hand-Railing.

EIGHTH PAPER.

Plate 58.

SECTION 2.—This section shows a stair, with winders in the quadrant, with a radius of two feet in the turning. Where the space is sufficient, a very imposing structure can be raised, giving character and effect to all the surroundings if all are in keeping, which of course, in such a building, would be the case.

Suppose the newel to be twelve inches at the base, the rail six inches wide, well moulded—the balusters three inches in diameter at the base, steps four or five feet long, the ends handsomely finished with nosings at least one and a half inches thick, the string faced with a handsome bracket, then a large niche in the angle, with a fine piece of statuary as an ornament. I know of no conception in character to equal it. The grandest sort of stairs can be built after this plan.

Fig. 1 shows the plan with the quarter wreath all in one piece, by working from the tangents a and b. If it is found desirable to have the wreath in two pieces, then the dotted lines show the angle of the tangents to be used. The height of two and a half instead of five risers will be the height for each piece.

Having laid down the plan, proceed to obtain the whole length wreath. Take the bevel and obtain the tangents from the sector, as applied at a, b, Fig. 1, on the rake, and draw the lines, a, b, Fig. 2 ; get the length, and lay off width of rail, to describe circle of wreath ; stick pins at the points c, d, e, f, and with long blade bevel, each blade pressing against the pins, with pencil in the angle, strike the circle, g, h, Fig. 2, to equal g, h, Fig. 1.

Fig. 3 is the lower wreath, and procured as before described.

Fig. 4 shows the ramp from flyer to winder.

Section 2 shows the plan of the commencement of a grand stairway intended for a large hall of a first-class house.

Fig. 1 is the plan of newel, cap, curved steps and risers, balusters, etc. I have not given the mode of curving the risers, supposing that any one sufficiently skilled to construct a stairway would certainly know how to bend a riser.

Fig. 2 is the starting wreath-piece, and is obtained in the way given in preceding notes, and needs no further explanation on this plate.

Fig. 3 is a side view of Fig. 1, showing section of cap and elevation of rail. The falling moulds for the wreath are obtained as laid down in preceding plates, to which reference must be had for further instruction.

To obtain the spring and plumb bevels, resort must be had to the sector, and proceed as laid down in former plates, having one leg of tangent bevel horizontal, and the other on a rake of the flyer ; then apply the small bevel in the usual way on both leaves of the sector. As it will be seen, that by one leg being placed horizontal and the other on the rake of the flyer the spring and plumb are not the same angle.

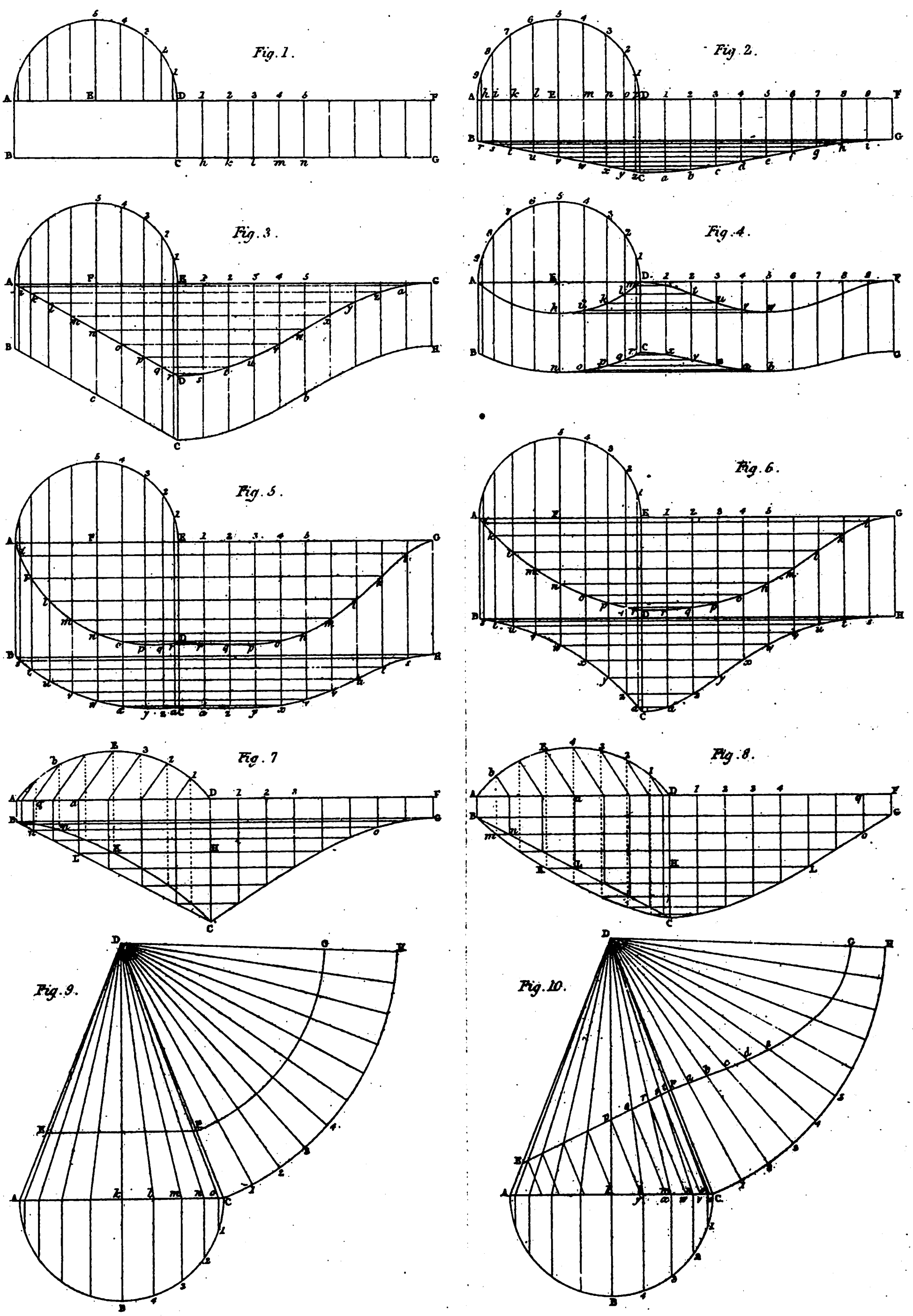
Correspondence.

WE invite communications from our readers in matters connected with the trades we represent. Be brief, courteous, and to the point.

Editor of the Wood-Worker :

THE eleven packages received all right. I am well satisfied with them. The WOOD-WORKER is so good a publication that I would

PLATE 59.



PRACTICAL CARPENTRY.